Fig. 1

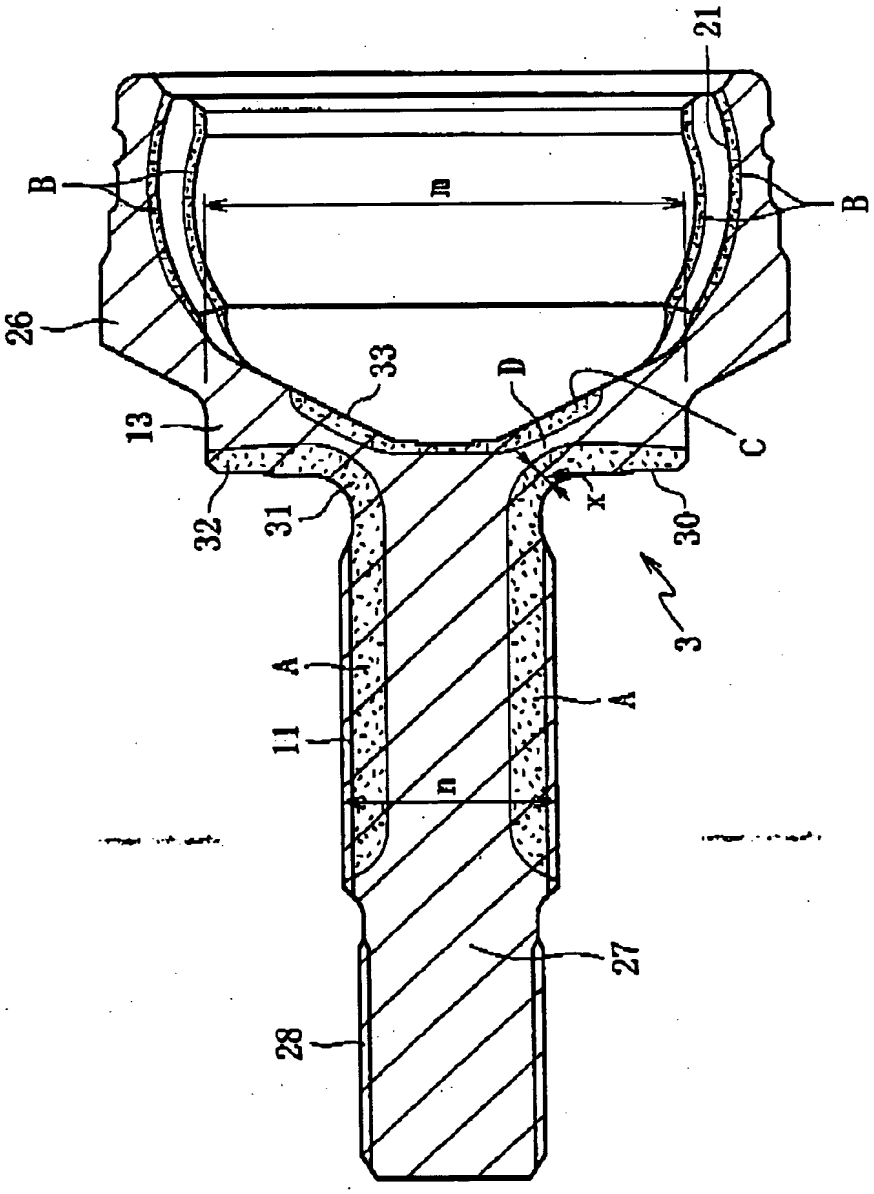

Fig. 2

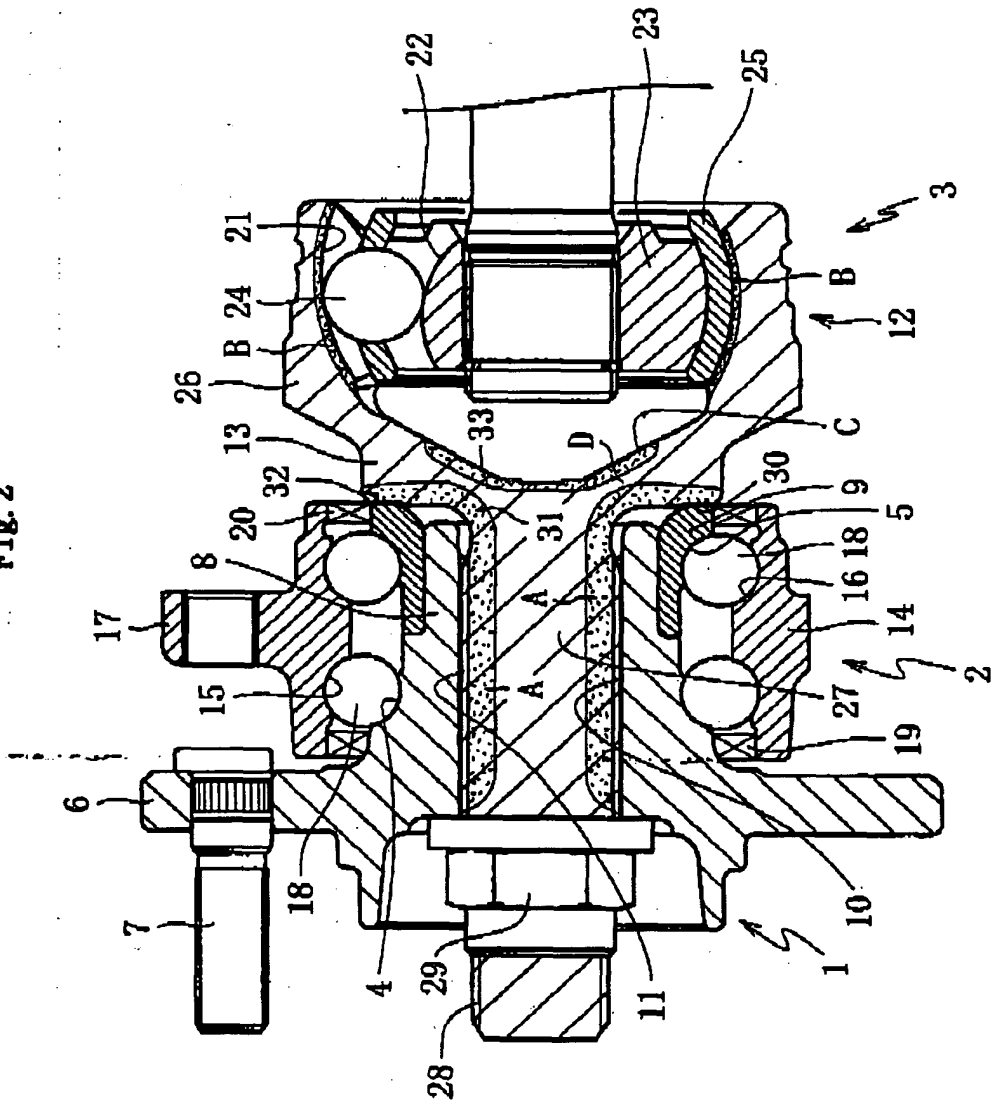
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Fig. 3

	Static torsion strength	Surface hardness (Hv) / Hardness effective depth (mm)		
		Base portion	Unhardened portion	Mouth bottom portion
Conventional product	Reference	672/1.8	230	–
Example a	○	670/1.8	230	703/0.8
Example b	◎	670/1.8	230	703/1.3
Example c	◎	670/1.9	230	703/2.6
Example d	○	668/1.8	230	703/3.9
Example e	×	595/1.0	230	701/4.5

Cross: Crack occurred. Lower than conventional one.
Circle: Better than conventional one.
Double circle: Far better than conventional one.

Fig. 4

	Ratio of step : m/n=1.5		Ratio of step : m/n=1.8		Ratio of step : m/n=2.0	
Heating time	Hardness/depth Hv/mm	Rate of crack occurrence at shoulder portion (%)	Hardness/depth Hv/mm	Rate of crack occurrence at shoulder portion (%)	Hardness/depth Hv/mm	Rate of crack occurrence at shoulder portion (%)
Short	665/2.5	0%	665/2.4	0%	665/2.4	0%
↓	671/2.9	0%	671/2.9	0%	671/2.8	0%
	662/3.0	0%	662/3.2	0%	662/3.0	0%
	660/3.5	0%	660/3.6	0%	660/3.1	61%
Long	660/4.2	0%	660/3.9	12%	660/3.1	88%

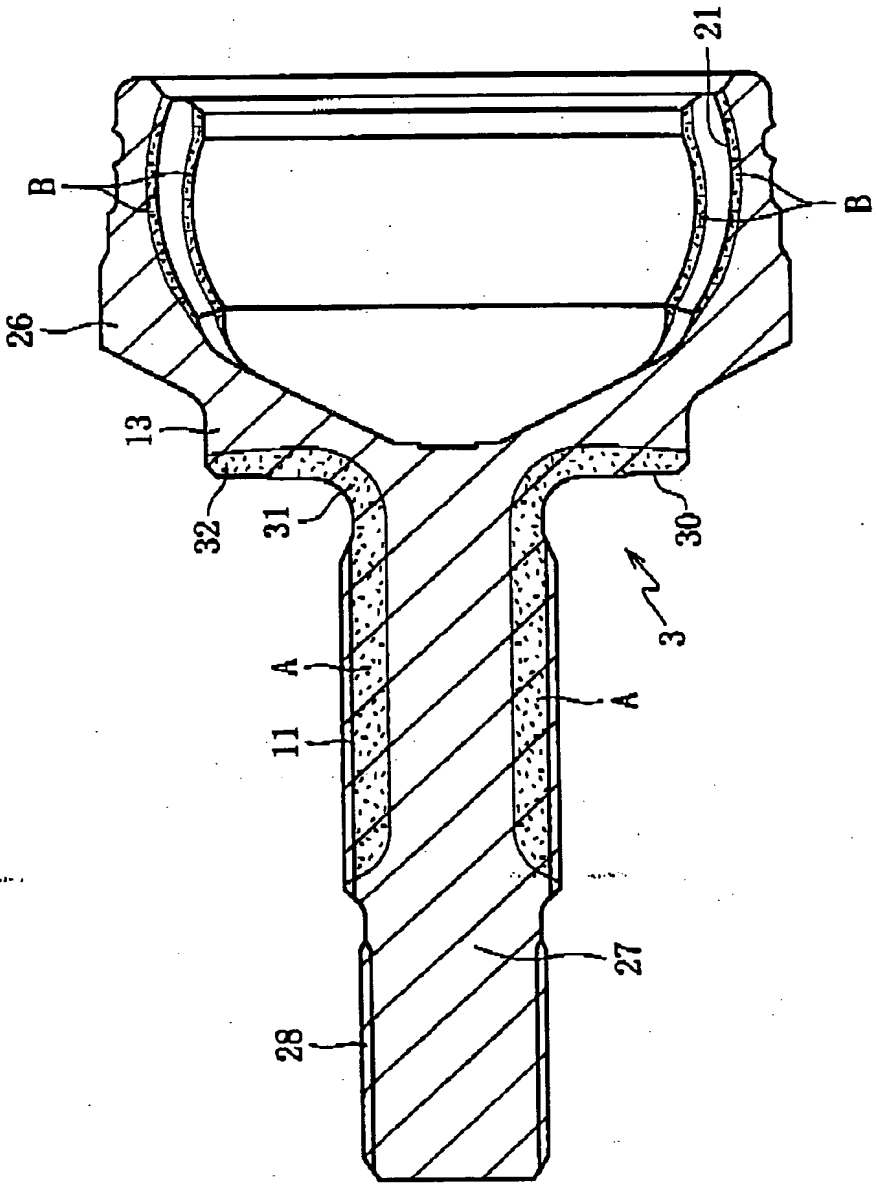
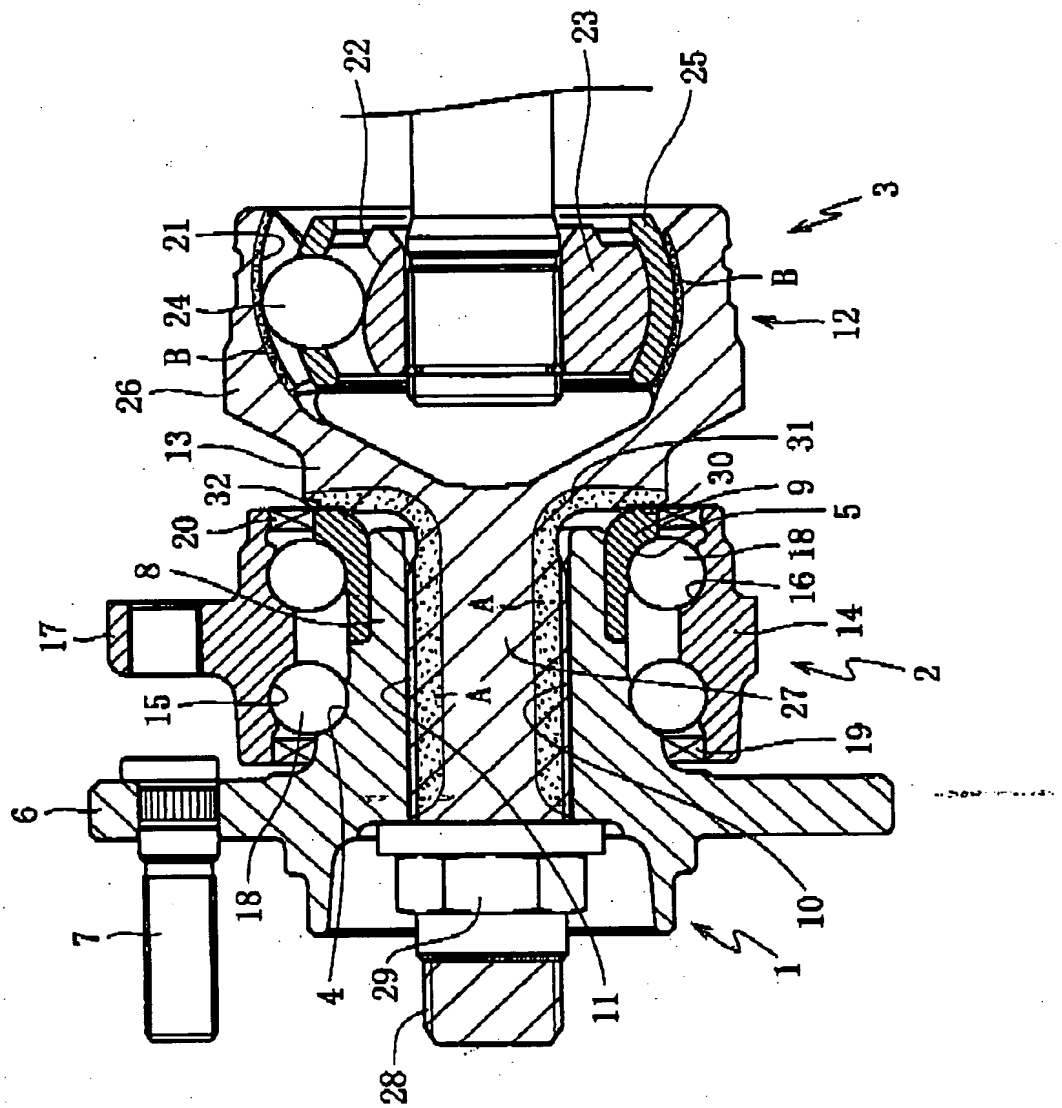


Fig. 5

Fig.6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